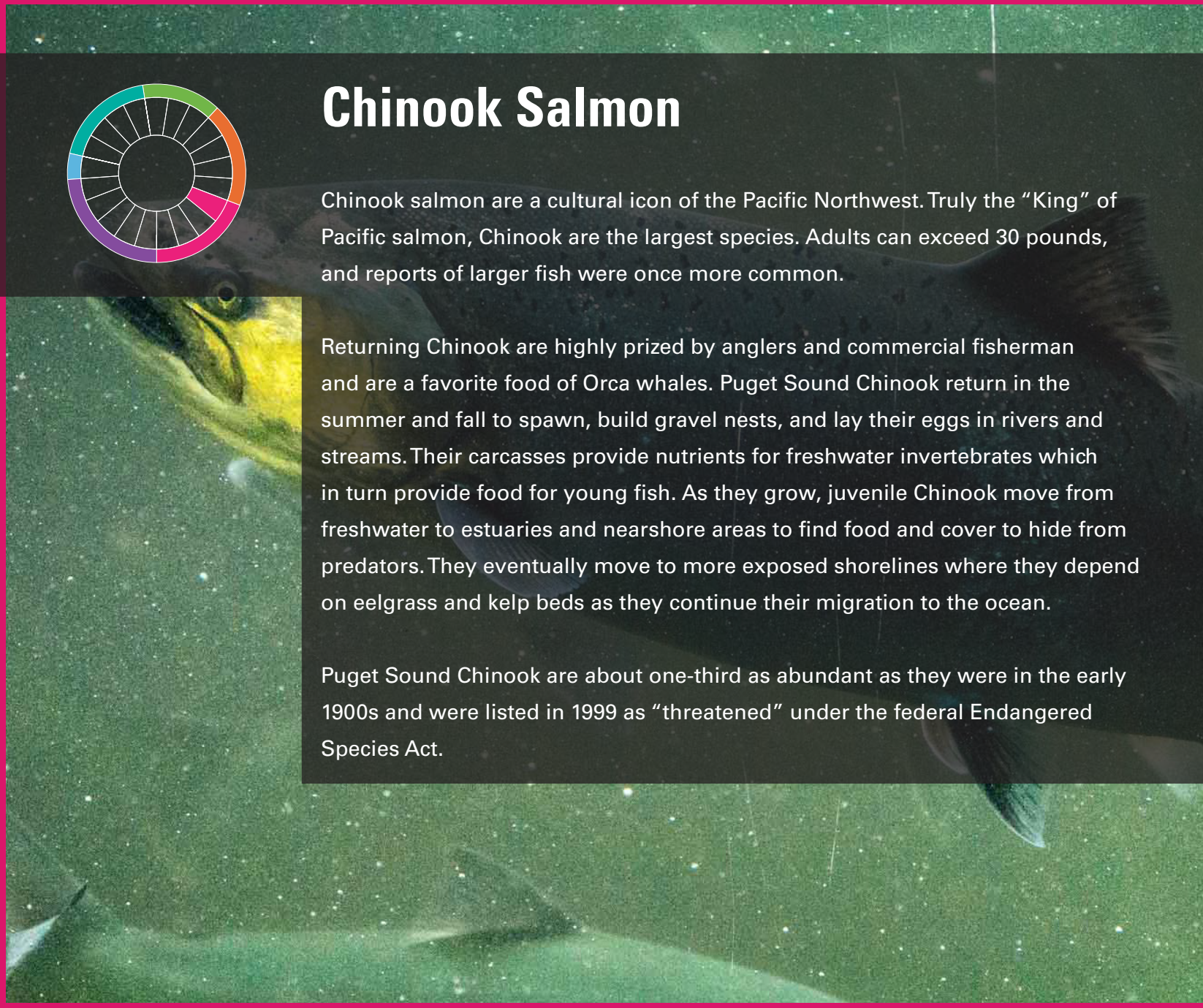


# Chinook Salmon

Chinook salmon are a cultural icon of the Pacific Northwest. Truly the "King" of Pacific salmon, Chinook are the largest species. Adults can exceed 30 pounds, and reports of larger fish were once more common.

Returning Chinook are highly prized by anglers and commercial fisherman and are a favorite food of Orca whales. Puget Sound Chinook return in the summer and fall to spawn, build gravel nests, and lay their eggs in rivers and streams. Their carcasses provide nutrients for freshwater invertebrates which in turn provide food for young fish. As they grow, juvenile Chinook move from freshwater to estuaries and nearshore areas to find food and cover to hide from predators. They eventually move to more exposed shorelines where they depend on eelgrass and kelp beds as they continue their migration to the ocean.

Puget Sound Chinook are about one-third as abundant as they were in the early 1900s and were listed in 1999 as "threatened" under the federal Endangered Species Act.

Photo Credit: Ingrid Taylar

# Chinook Salmon

**INDICATOR:**

**Chinook salmon population abundance as measured by the number of natural origin adult fish returning to spawn**

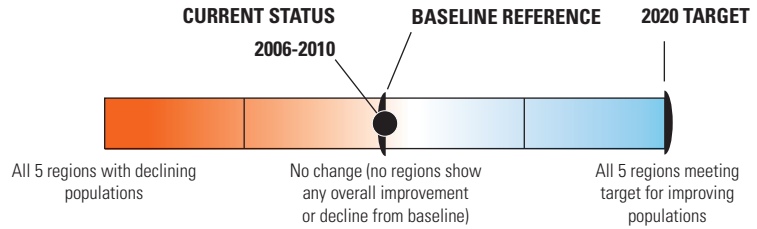
Indicator lead: Recovery Implementation Technical Team

**2020 TARGET:**

Stop the overall decline and start seeing improvements in wild Chinook abundance in two to four populations in each biogeographic region.

**PROGRESS:**

| IS THE TARGET MET? | NO | IS THERE PROGRESS? | NO |
|---|---|---|---|




From 2006-2010, most Chinook populations showed large annual variability in abundance but no discernable increasing or decreasing trends. Overall, only one population showed an improving trend, and one population showed a declining trend. None of the five regions have yet met their targets for improving population abundance.

## Progress Towards Target

For the 22 remaining populations of Puget Sound Chinook salmon, one increased and one declined in abundance from 2006 to 2010. Thus, none of the five regions are currently meeting their target of improving trends in two to four populations in each region.

The total number of Chinook salmon has not increased, and most populations remain well short of their recovery goals. Nonetheless, the fact that we have any natural-origin Chinook left is testament to the success of our restoration and harvest reduction work so far.

## What Is This Indicator?

Chinook population abundance is reported here two ways: The number of natural origin spawners and the number of natural origin recruits.

Spawning escapement is the number of Chinook salmon returning to rivers to spawn. Spawner abundance is normally estimated each year by counting the number of redds (gravel nests) in a river. Redds are counted by walking the stream and/or from boats or aircraft. For many populations, some hatchery-origin salmon mix with natural origin salmon on the spawning grounds, complicating our estimates of natural origin salmon returns. The proportion of spawners that were natural or hatchery origin is typically estimated based on the composition of carcasses and then extrapolated back to the total spawning population to estimate the number of natural origin versus hatchery-origin spawners.

The second measure, the total number of natural origin recruits, represents the potential return of adult salmon to the spawning rivers if there were no commercial, subsistence, or recreational harvest affecting them. This is the estimated total number of natural origin adult salmon before human harvest. The numbers of hatchery-origin fish were excluded from both estimates of Chinook abundance.

## Interpretation of Data

Chinook populations in Puget Sound exhibit large annual variations in abundance, as well as long-term fluctuations (over ten or more years) that confuse simple evaluations of short or long-term trends in numbers (Figure 1). Long-term natural-origin spawner abundance numbers have shown little progress towards the target, with numbers declining since the early 2000s. In addition, overall productivity and the total number of natural origin salmon recruits have declined according to NOAA. All Puget Sound Chinook populations are currently well below abundance levels (recovery goals)

**Abundance of Chinook Natural-Origin Spawners in Puget Sound**
*1990 –2010*

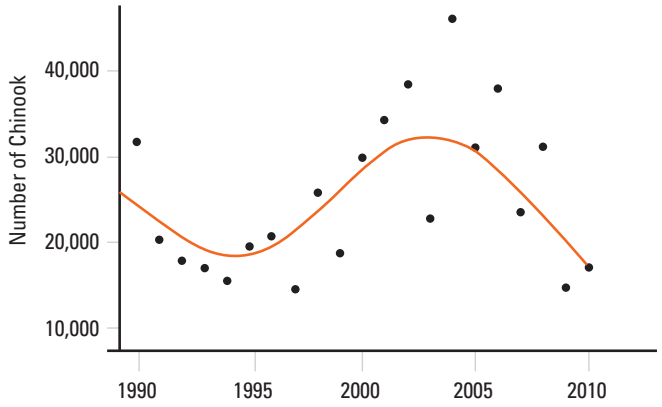



**Figure1.** Number of natural-origin Chinook spawners observed in Puget Sound watersheds for 22 populations. Shown are total numbers of natural-origin spawners observed each year (points) and a fitted line derived from locally weighted scatterplot smoothing.
*Source: NWFSC Salmon Population Summary database*


**Chinook Salmon Rivers**

County border | Salish Sea Basin boundary | Cities and Urban Growth Area

needed for populations to recover and to reduce their risk of extinction (Table 1). Chinook salmon in Puget Sound are currently listed as Threatened under the Endangered Species Act.

Trends for Chinook recruits were calculated for five- and ten-year periods. For 2006-2010, only two out of 22 populations showed a statistically significant trend. One population increased (Sammamish), and one population (Skokomish) decreased. In contrast, for a ten-year trend analysis from 2001-1010, nine out of 22 populations showed a statistically significant decrease in the number of fish.

## Puget Sound Chinook Abundance and Trends

| Region/Population | Recovery Goal[1] | Natural-Origin Spawners | Natural-Origin Recruits (Spawners + Harvest) | | |
|---|---|---|---|---|---|
| | Range | 5 year average[2] (2006-2010) | 5 year average (2006-2010) | 5 year Trend [3] (2006-2010) | 10 year Trend [3] (2001-2010) |
| **Strait of Georgia** | | | | | |
| N Fk Nooksack | 3,800 -16,000 | 274 | 470 | | |
| S Fk Nooksack | 2,000-9,100 | 265 | 475 | | |
| **Strait of Juan de Fuca** | | | | | |
| Elwha | 6,900-17,000 | 126 | 282 | | Decreasing |
| Dungeness | 1,200-4,700 | 122 | 336 | | |
| **Hood Canal** | | | | | |
| Skokomish | Unknown | 501 | 863 | Decreasing | |
| Mid-Hood Canal | 1,300-5,200 | 45 | 78 | | Decreasing |
| **Whidbey Basin** | | | | | |
| Suiattle | 160-610 | 219 | 301 | | |
| N Fk Stillaquamish | 4,000-18,000 | 465 | 803 | | |
| S Fk Stillaquamish | 3,600-15,000 | 79 | 133 | | Decreasing |
| Cascade | 290-1,200 | 315 | 431 | | |
| Upper Sauk | 750-3,030 | 584 | 812 | | |
| Lower Sauk | 1,400-5,600 | 620 | 1,252 | | |
| Skykomish | 8,700-39,000 | 2,336 | 3,081 | | Decreasing |
| Snoqualmie | 5,500-25,000 | 1,390 | 3,013 | | Decreasing |
| Upper Skagit | 5,380-26,000 | 8,118 | 15,134 | | Decreasing |
| Lower Skagit | 3,900-16,000 | 1,629 | 3,252 | | |
| **Central/South Puget Sound** | | | | | |
| White R | unknown | 1,216 | 1,435 | | Decreasing |
| Green/Duwamish | 27,000 | 1,311 | 6,005 | | Decreasing |
| Sammamish | 1,000-4,000 | 92 | 148 | Increasing | |
| Cedar | 2,000-8,200 | 807 | 1,389 | | |
| Nisqually | 3,400-13,000 | 501 | 3,000 | | |
| Puyallup | 5,300-18,000 | 831 | 1,520 | | Decreasing |

**Table 1**. Puget Sound Chinook abundance and trends.

[1] High and low productivity planning targets from Table 2 "Chinook Spawner Abundance Planning Targets & Ranges for Puget Sound Region" in Final Supplement to the Shared Strategy's Puget Sound Salmon Recovery Plan. November 2006. National Marine Fisheries Service.

[2] Averages are geometric means; data from NOAA's Northwest Fisheries Science Center's Salmon Population Summary database.

[3] Significance of trends ($p < 0.05$) was calculated using methods reported in NOAA's Status Review Update for Pacific Salmon and Steelhead Listed under the Endangered Species Act (Ford [ed.], 2011).

# Freeing the Elwha River

## Removing Dams for the Sake of Salmon

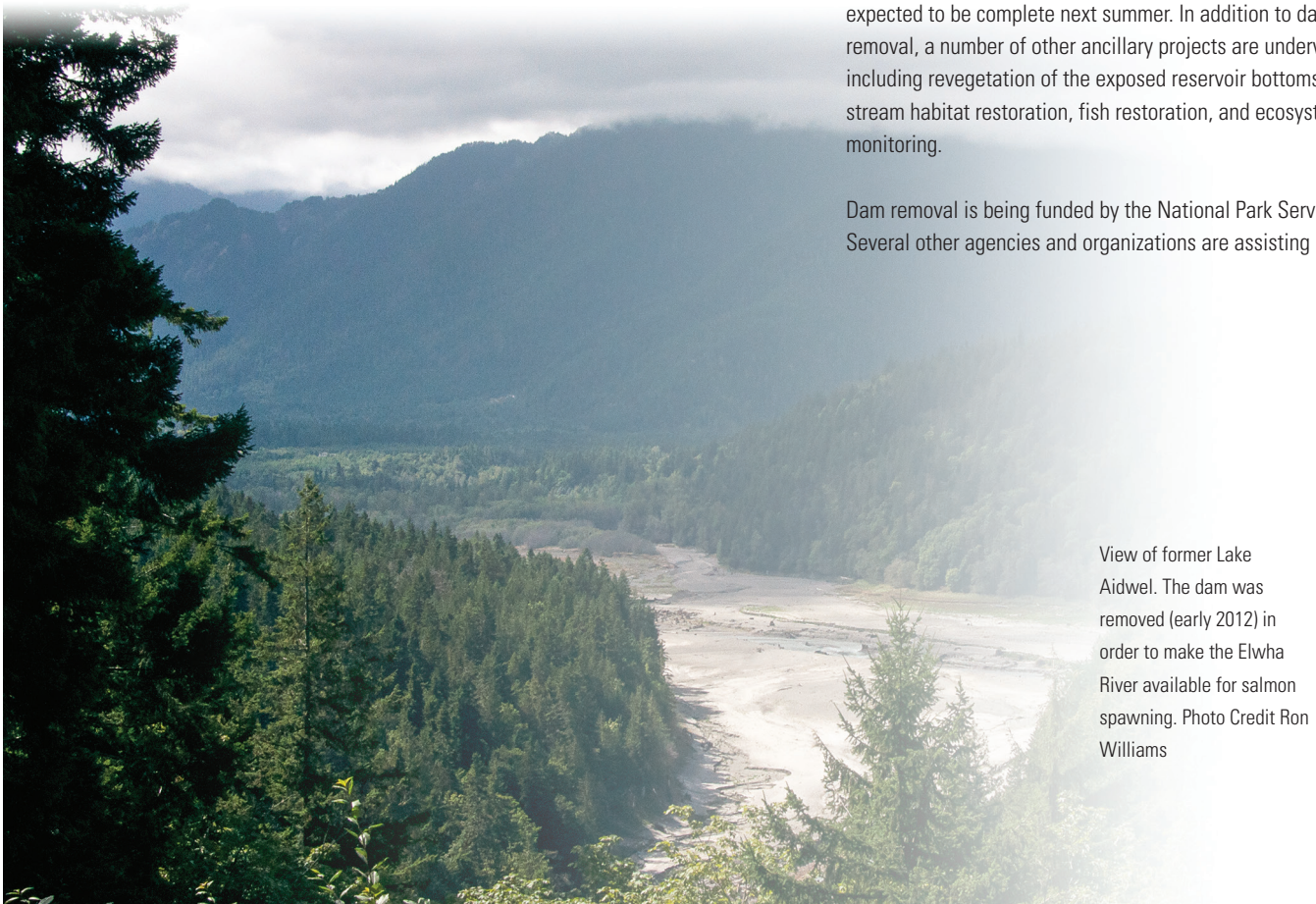
The Olympic Peninsula's Elwha River was once one of the richest salmon runs in the Pacific Northwest. All five species of Pacific salmon and other anadromous fish (species that migrate from fresh water to salt water and back again to reproduce) used to spawn in the Elwha by the tens of thousands each year—until two dams built in the early 1900s blocked access to all but the lowest five miles of the river.

Thanks to the largest dam removal project in U.S. history, the Elwha River will soon flow freely from its headwaters in the Olympic Mountains to the Strait of Juan de Fuca, giving salmon access to over 70 miles of river and tributary habitats for the first time in nearly 100 years.

## Project Milestones

Two Elwha River restoration milestones have been met in the last year: the completion of the Elwha Dam removal and the partial removal of Glines Canyon Dam, which is expected to be complete next summer. In addition to dam removal, a number of other ancillary projects are underway, including revegetation of the exposed reservoir bottoms, in-stream habitat restoration, fish restoration, and ecosystem monitoring.

Dam removal is being funded by the National Park Service. Several other agencies and organizations are assisting and funding associated ecosystem restoration activities, including the Lower Elwha Klallam Tribe, National Marine Fisheries Service, National Oceanic and Atmospheric Administration Restoration Center, US Fish and Wildlife Service, US Bureau of Reclamation, US Geological Survey, Washington Department of Fish and Wildlife (WDFW), Coastal Watershed Institute, Washington Sea Grant, University of Washington, Peninsula College, and several others.



View of former Lake Aidwel. The dam was removed (early 2012) in order to make the Elwha River available for salmon spawning. Photo Credit Ron Williams

## Restoring Salmon

Although the Elwha River and its tributaries above Glines Canyon Dam were in a natural state, the ecosystem was missing a key component—anadromous fish.

In spring 2012, scientists from the cooperating organizations began transporting adult coho salmon collected at the Lower Elwha Tribe's hatchery and wild steelhead to the pristine waters above the former Elwha Dam site in hopes that these fish would spawn in the wild and help recolonize the river in the future. This along with natural colonization by wild steelhead (early summer) and Chinook salmon (late summer and fall) into the river above Elwha Dam resulted in spawning in areas that haven't seen spawners in 100 years.

Fish restoration actions include collecting adult fish as brood stock to seed supportive breeding programs operated by WDFW and the Lower Elwha Klallam Tribe. The programs are designed to help preserve five species of

# Freeing the Elwha River

anadromous salmon and steelhead in the river through the dam removal periods when lower watershed conditions will be inhospitable for natural-origin fish production, and assisting in their recovery to a healthier status so that recolonization of newly accessible habitat is accelerated. Other important restoration actions include removing brood stock from sediment-laden river water and moving them to clean water areas upstream of the Elwha Dam site as described above. These fish restoration actions are intended to protect ESA listed species from the high-suspended sediment levels that are expected to be lethal to fish during and shortly after dam removal.

Restoring salmon and other fish species will also increase the productivity of plants and wildlife throughout the watershed. Salmon and steelhead eggs, juveniles, and the carcasses that remain after fish spawn and die are an important part of Pacific Northwest river ecosystems. Salmon bring nutrients from the ocean when they return to spawn. These nutrients are used by hundreds of terrestrial and aquatic animals and provide nutrients for riparian vegetation.

## Long-term Benefits

Returning the entire Elwha River to a more natural state will restore one of the largest watersheds on the Olympic Peninsula and provide significant long-term benefits for Puget Sound recovery. More than 80% of this important watershed is located within the protected boundaries of the Olympic National Park and consists of high quality, primarily untouched habitat. Completing the removal of the dams will allow natural sediment transport that will improve river and estuarine habitat quality, reduce nearshore beach and bank erosion, increase intertidal and sub-tidal sediment, and support marine community diversity. Restoring the Elwha River will also assist in the recovery of Elwha River salmon, steelhead, and other key fish species.


Photos from the Elwha Dam removal webcam. Photo Credit: Elwha River Restoration Project